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EXAMINER

KEEHAN, CHRISTOPHER M

ART UNIT

PAPER NUMBER

1712

DATE MAILED: 04/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/778,996

Applicant(s)PAPATHOMAS, KONSTANTINOS
I.**Examiner**

Christopher M. Keehan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 February 2005.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,5,6,8,14,18-29,31,37,39,41,43,44 and 46-50 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1,5,6,8,14,18-29,31,37,39,41,43,44,46-50 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Arguments

In view of the appeal brief filed on 10/12/04, PROSECUTION IS HEREBY REOPENED. The claims have been treated as set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

- (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,
- (2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Applicant's arguments filed 10/12/04 have been fully considered. Although the claim rejections have been withdrawn in light of new rejections, a response to some pertinent arguments of applicant follows. The claims have been treated as set forth below. Regarding the rejection over Shiobara et al., applicant has argued, beginning at page 20 of the last filed appeal brief, that the examiner didn't identify a flexibilizer of Shiobara et al. The examiner set forth a section of Shiobara et al. that specifically

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shows the components as mentioned by applicant, such as silicone rubber (applicant's polysiloxanes), methyl methacrylate-butadienestyrene copolymer (applicant's copolymers of butadiene and styrene), butyl rubber (applicant's liquid polybutadiene rubber), and the epoxy-siloxane copolymers set forth at columns 10-12 (which covers applicant's epoxy functionalized rubbers and polysiloxanes). While Shiobara et al. do disclose an amount of the copolymer, the moieties at col.9, lines 12-15 are clearly included as stress reducing agents.

Further, at col.12, lines 57-61, Shiobara et al. disclose that the copolymer is blended in an amount range of 0 to 20 parts, and preferably 2 to 15 parts of the diorganopolysiloxane units may be present per 100 parts by weight of the epoxy resin. Applicant contends that the diorganopolysiloxane of Shiobara et al. is not the encapsulant composition and contends that the diorganopolysiloxane is rather the starting material from which the copolymer is generated. A preferred copolymer comprising the diorganopolysiloxane is disclosed by Shiobara et al. at columns 11 and 12, in the middle of the page (the top copolymer). Looking at this preferred copolymer, and choosing values that are readily envisaged for the variables (R =methyl, R^1 =hydrogen, $p=1$, $q=1$, and $n=4$), which is the simplest structure based on the variables, the molecular weight of the diorganopolysiloxane unit is 725.6. The molecular weight of the phenolic or epoxy residue unit is 887.2. Therefore, when the diorganopolysiloxane is present at two parts by weight, the rest of the copolymer is present at 2.45 parts by weight : $2+2.45=4.45$ parts by weight, which is included in applicant's claimed range for the flexibilizer. It should be noted that while the preferred

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range of Shiobara et al. is from 2 to 15 parts by weight of the diorganopolysiloxane, Shiobara et al. also disclose a range of 0 to 20 parts by weight. If the diorganopolysiloxane of Shiobara et al. is chosen as being present at one part by weight, the rest of the copolymer is present at 1.2 parts by weight: $1+1.2=2.2$ parts by weight, which is also included in applicant's claimed range.

Applicant has argued, at page 22 of the appeal brief, that the copolymer of Shiobara et al. does not meet applicant's claimed flexibilizer, and relies on the definition of a flexibilizer in the specification for support. Applicant also contends that the only definition of the copolymers of Shiobara et al. are used for stress reduction, and the type of stress is not defined. Clearly a component such as defined by Shiobara et al., added for the purpose of stress reduction, acts as a flexibilizer. When more copolymer is added, stress in the composition is reduced, which results in a more flexible composition, and vice versa.

Applicant has argued, at page 23 of the appeal brief, that Shiobara et al. do not disclose glycidyl ethers as claimed in claims 5 and 28. This is not clear because the structures at the bottom of column two and the top of column three contain glycidyl ether groups.

Applicant has argued, beginning on page 23 of the appeal brief, that Shiobara et al. do not disclose a flexibilizer as claimed in claims 8 and 31, the reasoning as set forth above applies to this argument.

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Applicant has argued, at page 25 of the appeal brief, that Shiobara et al. do not disclose a cycloaliphatic epoxy resin as claimed in claim 26. This is not clear because cyclopentadiene type epoxy resin is a cycloaliphatic resin.

Claim Rejections - 35 USC § 102

The rejection of claims 1, 5, 8, 14, 18-23, 25, 26, 28, 31, 37, 39, 41, 44, and 46-50 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Shiobara et al. (6,376,100 B1) has been withdrawn in light of a new rejection.

Claim Rejections - 35 USC § 103

The rejection of claims 1, 5, 6, 14, 18-29, 31, 37, 39, 41, 43, and 48-50 under 35 U.S.C. 103(a) as being unpatentable over Christie et al. (5,668,059) has been withdrawn due to applicant's in light of a new rejection.

The rejection of claims 1, 5, 6, 8, 44, and 48 under 35 U.S.C. 103(a) as being unpatentable over Day et al. (6,444,407 B1) has been withdrawn due to applicant's showing of common assignment.

The rejection of claims 23 and 43 under 35 U.S.C. 103(a) as being unpatentable over Shiobara et al. (6,376,100 B1) in view of Christie et al. (5,668,059) has been withdrawn in light of a new rejection.

The rejection of claim 27 under 35 U.S.C. 103(a) as being unpatentable over Shiobara et al. (6,376,100 B1) in view of Potter (Epoxide Resins) has been withdrawn in light of a new rejection.

New Claim Rejections - 35 USC § 102/103

Claims 1, 5, 8, 14, 18-22, 25, 26, 28, 31, 37, 39, 41, 44, and 46-50 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Shiobara et al. (6,376,100 B1). Regarding claims 1, 5, 8, 18, and 25, 26, 28, and 31, Shiobara et al. disclose an electronic package comprising a substrate having an upper surface, a semiconductor chip mounted on a portion of the upper surface and electrically coupled to the substrate, the semiconductor chip having a bottom surface and at least one edge surface being substantially perpendicular to the bottom surface, and encapsulant composition positioned on at least a portion of the upper surface of the substrate and against at least a portion of the at least one edge surface of the semiconductor chip (Figure 2A) comprising a resin material of epoxy resin comprising glycidyl ethers (col.2, line 44-col.3, line 19), a flexibilizing agent selected from the group as instantly claimed, for instance polysiloxanes and epoxy functionalized rubbers (col.9, line 49-col.12, line 56, structures), comprising 2 to 15 parts by weight of the composition (col.12, lines 57-61), and a filler material comprising substantially spheroidal particles, with a maximum particle size included in applicant's range (col.3, lines 20-35). As set forth above, the flexibilizer/stress reducer of Shiobara et al. is

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added to the composition in an amount included in applicant's range. For an amount of flexibilizer/stress reducer that is outside applicant's claimed range, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added more or less flexibilizer/stress reducer to the composition of Shiobara et al. if one desired a more or less flexible composition. It is the examiner's position that it is well known in the art to vary the amount of flexibilizer in a resin composition to achieve desired flowability or shock resistance.

Regarding claims 14 and 37, Shiobara et al. disclose a coupling agent positioned on at least a portion of the spheroidal filler (col.3, lines 44-52).

Regarding claims 19-22, Shiobara et al. disclose a substrate as claimed (col.14, lines 37-38 and 48-49). It is the examiner's position that an FR-4 substrate is an epoxy substrate with glass fiber reinforcement, and a BT substrate is a bismaleimide-triazine substrate.

Regarding claim 39, Shiobara et al. disclose a catalyst material selected from the group as instantly claimed (col.8, lines 10-40).

Regarding claim 41, the same reasoning as set forth above for claims 1 and 18 also applies to claim 41, as the claimed subject matter is essentially the same, except for the method steps as claimed. Shiobara et al. disclose adding to the first quantity of resin material a second quantity of flexibilizing agent by homogenizing the flexibilizing agent in the first quantity by reacting the resin material and the flexibilizing agent together (col.12, lines 57-61) at a temperature of greater than about 100°C (col.13, lines 30-34).

Regarding claims 44, 46, and 47, Shiobara et al. disclose a flexibilizer comprising a thermoplastic material containing a thermoplastic oligomer backbone (col.9, line 12-col.12, line 61).

Regarding claims 48-50, Shiobara et al. disclose a maximum particle size of up to 50 microns, which exceeds 31 microns (col.3, lines 20-35).

New Claim Rejections - 35 USC § 103

Claims 1, 5, 6, 8, 23, 24, 27, 29, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Christie et al. (5,668,059) in view of Shiobara et al. (6,387,100 B1). Shiobara et al., as applied above, are as set forth and incorporated herein.

Regarding Claims 1, 5, and 6, Christie et al. disclose an encapsulant composition comprising a resin material selected from the group consisting of epoxy and cyanate ester resins, wherein the resin material is a cycloaliphatic epoxide, derived from unsaturated aromatic hydrocarbon compounds, comprising glycidyl ethers, wherein the resin material is at least a dicyanate ester, and wherein the resin material comprises about 20 percent to about 55 percent by weight of the composition (col.3, line 20-col.9, line 46), a flexibilizing agent (col.11, lines 14-33), and a filler material (col.9, line 46-col.10, line 10). Christie et al. also disclose that the flexibilizer is added in small amounts to impart desirable mechanical properties to the composition, from 0.56% to about 1.6% by weight (as set forth in the previous office action). Christie et al. do not appear to disclose an amount of flexibilizer as instantly claimed, and a substantially spheroidal or spherical filler, although they do disclose the same filler as applicant's.

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Shiobara et al. disclose an encapsulant composition comprising a resin material of epoxy resin comprising glycidyl ethers (col.2, line 44-col.3, line 19), a flexibilizing agent selected from the group as instantly claimed (col.9, line 12-col.12, line 61), comprising 2 to 15 parts by weight of the composition (col.12, lines 57-61), and a filler material comprising substantially spheroidal particles, with a maximum particle size included in applicant's range (col.3, lines 20-35). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added flexibilizer in an amount included in applicant's range, as taught by Shiobara et al., to the resin composition of Christie et al. because Shiobara et al. teach that the addition of more flexibilizer further reduces the stress in the composition, resulting in a more effective and higher quality composition. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used spheroidal or spherical filler particles, as taught by Shiobara et al., in the resin composition of Christie et al., because Shiobara et al. teach that the resin composition, which is being applied as an underfill (the same use as that of applicant), because the use of spherical or spheroidal particles would improve the flow of the resin into the underfill area of the component, thereby reducing friction of flow, resulting in a higher quality and more effective underfill composition.

Regarding claim 18, the same reasoning as set forth above for claim 1 also applies to claim 18, as the claimed subject matter is essentially the same. Christie et al. disclose an electronic package as instantly claimed (Figure).

Regarding claims 23 and 24, Christie et al. disclose the substrate as instantly claimed (col.12, line 12-col.14, line 45).

Regarding claims 25-27 and 29, Christie et al. disclose an encapsulant composition comprising a resin material selected from the group consisting of epoxy and cyanate ester resins, wherein the resin material is a cycloaliphatic epoxide, derived from unsaturated aromatic hydrocarbon compounds, comprising glycidyl ethers, wherein the resin material is at least a dicyanate ester, (col.3, line 20-col.9, line 46).

Regarding claims 41 and 43, Christie et al. do not appear to specifically disclose the instantly claimed method steps. Christie et al. disclose the step being performed under vacuum (col.11, lines 57-67). However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added the flexibilizer to the resin at an elevated temperature in a separate step because the flexibilizer acts to make the resin composition more resilient, and if not mixed with the resin and melted into the composition, then it does not have the desired flexibilizing effect on the composition.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher M. Keehan whose telephone number is (571) 272-1087. The examiner can normally be reached on Monday-Friday, from 6:30 to 3:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy P. Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christopher Keehan *CJK*

April 13, 2005

DAVID J. BUTTNER
PRIMARY EXAMINER

David Buttner